Chapter 1 – Construction Site Management

The purpose of this section is to identify the management practices that should be employed at construction sites to guarantee a successful project before, during and through a lifetime of site use and maintenance. The Bellevue Parks & Community Services Department manages construction sites to preserve existing vegetation and infrastructure for several reasons:

- To sustain both the function and value of vegetation assets.
- To enhance public safety by carefully maintaining the health of onsite vegetation and to reduce liability.
- To contain costs associated with site restoration.
- To reduce or avoid soil compaction and degradation.
- To avoid physical injury to existing trees.
- To avoid root injury to trees and other vegetation.
- To protect soils and hydraulic integrity of the entire site.
- To protect existing irrigation, utilities and underground drainage.
- To prevent sediment-laden and/or polluted runoff from entering drainage systems and water bodies (streams, wetlands, lakes).

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1.2 Definitions

Construction Site Management – Refers to the management of construction activities during three phases of site development: pre-

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construction, construction, and post-development. These include BMP's for erosion control, shrubs, trees, drainage patterns, and irrigation systems. Tree preservation is a special concern during construction because tree roots can often extend throughout an entire site, and mature trees increase property value.

Critical Root Zone (CRZ) – The circular area around the base of a tree calculated as half the distance to the tree's dripline.

"Dial-Before-You-Dig" – A statewide system is in place to allow contractors to locate underground utilities before construction. This contact is mandatory. The phone number is **1-800-424-5555** or **811** (account #34476).

Diameter at Breast Height (DBH) – The diameter of the tree trunk at four and one-half feet (or 54 inches) above natural grade level. The diameter may be calculated by using the following formula: DBH= circumference at 4.5-feet x 3.14. To determine the DBH of multi-trunk trees or measuring trees on slopes, consult the current *Guide for Plant Appraisa*l, published by the Council of Tree and Landscape Appraisers.

Developmental Services Division (DSD) – City department that establishes land use and zoning guidelines, provides code enforcement, issues permits and provides inspections for construction, renovation and enhancement projects.

Project Manager – Refers to either the person assigned to the construction project by the department or the contractor who is responsible for managing the overall project. Project management duties include schedule, budget, and related logistics, including construction site management.

Root Buffer – A temporary layer of material to protect the soil texture and roots. The buffer shall consist of a base course of tree chips spread over the root area to a minimum of 6-inch depth, capped by a layer of 3/4-inch quarry gravel to stabilize 3/4-inch plywood on top.

Soil Compaction – The compression of soil particles that may result from the movement of heavy machinery and trucks, storage of construction materials, structures, paving, etc. within the *tree protection zon*e. Soil compaction can result in atrophy of roots and potential death of the tree, with symptoms often taking 3 to 10 years to manifest.

Temporary Erosion & Sedimentation Control (TESC) – A system of best management practices on a construction site designed to prevent

displacement of soil particles and remove eroded sediment from storm water.

Tree Protection Fencing – A temporary enclosure erected around a tree to be protected at the boundary of the *tree protection zone*. Tree protection fencing should consist of five or six foot high chain link (or construction) fence, mounted on two inch diameter galvanized iron posts, driven into the ground to a depth of at least 2-feet at no more than 10-foot spacing. The fence serves three primary functions: 1) to keep the crown, branch structure and trunk clear from direct contact and damage by equipment, materials or disturbances; 2) to preserve roots and soil in an intact and non-compacted state; and 3) to identify the tree protection zone in which no soil disturbance is permitted and activities are restricted.

Tree Protection Zone (TPZ) – The circular area around the base of a given tree calculated as 1 foot of radius for every inch of trunk diameter measured at DBH.

Warning Sign – A warning sign shall be prominently displayed on each fence. The sign shall be a minimum of 8.5 x 11-inches and clearly state: "WARNING – *Tree Protection Zone* - This fence shall not be removed and any injury to this or these trees is subject to penalty according to BCD 14.06.100."

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1.3 Background

Many problems encountered in landscape maintenance can be traced to poor management of original construction. If construction equipment improperly strikes or grades over vegetation, those plants often suffer or die. If a site's soil is overly compacted or contaminated, it will not allow the air and water movement essential for healthy root zones and plants. If hydrologic processes on site are disrupted, the site may forever have drainage problems. These and other construction-related impacts can produce long-term maintenance problems that can be avoided by following the BMPs set forth in the remainder of this section.

1.4 Best Management Practices

Pre-Construction

- The project manager shall consult with DSD and acquire all

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necessary permits for each specific construction project. The project manager will coordinate all required code enforcement inspections with DSD staff.

- National Pollutant Discharge Elimination System (NPDES) requirements for erosion control shall be established prior to construction. Specific requirements of NPDES are covered in chapter 2 – *Stormwater Pollution Protection Plan (SWPPP) for Park Operations*.
- The project manager shall know and understand the development and building regulations concerning trees and vegetation in the area.
- The project manager will contact "Dial-Before-You-Dig" (1-800-424-5555) to locate any underground utilities onsite before construction begins.
- The project manager will be responsible for decisions related to vegetation on site before and during removal.
- The site shall be inventoried and surveyed if necessary. Site inventory includes determining size, species, and numbers of trees/plants on site; locating irrigation and drainage systems and problems, if any, of root intrusions into the drainage and other utility systems. Property corners shall also be identified, if necessary, prior to work.
- The project manager shall ensure that irrigation and drainage systems are operable and adequate.
- The project manager shall identify and protect natural water flows and drainage patterns and maintain vegetated buffers.
- An erosion control plan and turbidity monitoring plan for projects near streams and wetlands shall be developed as necessary.
- All trees and plants to be preserved and protected shall be identified on site plans.
- The project manager should consult the site manager(s) for site history and maintenance prior to finalization of site plans.

Construction Site Preparation

- Staging areas for equipment shall be established far enough from plant material so that existing plants and their roots are protected.
- Entry and exit routes shall be established and fenced off with chain link or construction fencing. When planning routes, avoid

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utility access corridors.

- 6' high chain-link fencing, or other adequate tree protection fencing, shall be installed around the tree protection zone and any other vegetation that will remain onsite. At the discretion of the project manager, the fencing shall be installed at least 1 foot out from the trunk for every inch diameter of the existing trees or farther.
- If tree protection cannot be installed at the predetermined TPZ because of site constraints, the fencing can be moved no closer than the CRZ and an adequate root buffer shall be constructed in the affected area of the TPZ.
- Irrigation and drainage systems shall be protected from damage unless plans call for renovation of such systems.
- All trees and plants in the construction zone shall be pruned as necessary to remove deadwood and prevent damage from construction equipment.
- Trees/plants to be preserved shall be watered and fertilized before and after construction at the discretion of the project manager.

Construction

Trees vary in their ability to adapt to altered growing conditions. Mature trees have established stable biological systems in the pre-existing physical environment. Disruption of this environment by construction activities interrupts the tree's physiological processes causing depletion of energy reserves and a decline in vigor, often resulting in the tree's death. Typically, this reaction may develop from one to seven years after disruption. The tree protection BMPs are intended to eliminate undesirable consequences that result from uninformed or careless acts and preserve both trees and property values. The following BMPs, if followed, will reduce the negative impacts of park construction on trees:

- Tree protection fencing will be constructed at the outer limit of the TPZ. If the fencing must enter inside the TPZ, root buffer will be constructed. One warning sign will be displayed for every 15 feet of lineal fencing, facing toward the work area. No activity is allowed in the CRZ of the trees being protected.
- On occasion, trees will need to have branches pruned in order to facilitate access to a construction site or the construction of a

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new facility. Pruning will follow International Society of Arboriculture Pruning Guidelines.

- Trenching and excavation activities are prohibited within the TPZ.
- When utility installation must occur within the TPZ, tunneling shall be the preferred method to install such utilities. The tunnel shall be dug either by hand, air spade, hydraulic vacuum or mechanically boring the tunnel under the roots with a horizontal directional drill and hydraulic or pneumatic air excavation technology.
- Construction shall be monitored regularly to ensure compliance with specifications. Work shall be stopped if construction site management BMP's are not being followed by the contractor.
- Cement washout pits and chemical holding areas shall be located away from vegetation protection areas, streams, and wetlands.
- Contractor parking and material storage shall be limited to already impacted areas away from tree roots.
- Site offices and equipment shall not encroach into vegetation protection areas.
- Whenever possible, control and minimize grade changes within vegetation protection areas. Generally, no changes in grade should occur within the TPZ of any tree to remain on site. This area may be increased at the discretion of the project manager. If the grade must be raised around a desired tree, a dry well shall be constructed around the tree at the drip line or some point farther out.
- Refueling and maintenance areas shall be kept away from trees, native soils, water bodies and drainage systems. Fuel spills will not be tolerated on construction sites. If pollutants leak or are discharged into a water-body, the City of Bellevue Clearing and Grading Inspector, as well as the Department of Ecology shall be contacted.
- To the extent possible, construction equipment shall be kept away from all onsite vegetation, especially those within designated protection areas.
- TESC implementation, maintenance, and removal shall follow COB regulations.

Post-Construction

Maintaining preserved and establishing new vegetation is the primary focus following construction. This requires identifying problems and treatments that may preserve these resources. If warranted, severely damaged vegetation should be removed and replaced by the contractor at their expense with new plantings.

The following practices should be employed to preserve vegetation:

- Weekly water management (most important item), at least 1" per week between May 1st – Sept. 30th, corresponding with drier weather.
- Insure contractor compliance with plant establishment warranty period.
- Fertilize with an appropriate product, as needed.
- Wait one growing season for pruning and minimal nitrogen applications. Maintain levels for 3 to 5 years.
- Maintain a depth of 2 to 3 inches of mulch around trees and shrubs, and new plantings.
- Watch closely for pests and changes in plant structure. Preventative treatments may be advisable.
- Maintenance staff shall closely monitor and inspect all new construction throughout the warranty period to ensure plant establishment.
- Special emphasis will be placed on weed control during the plant establishment period (3 to 5 years).
- For enhancement projects completed within Sensitive/Critical Areas or Sensitive/Critical Area Buffers, the project manager shall coordinate all monitoring protocol as established and enforced by DSD. Specific information concerning Sensitive/Critical Area management is covered in chapter 9 – Forests and Natural Areas.

Mitigating Tree Infrastructure Conflicts

Conflicts may occur when tree roots grow adjacent to paving, foundations, sidewalks or curbs (hardscape). Improper or careless extraction of these elements can cause severe injury to the roots and instability or even death of the trees. The following alternatives must first be considered before root pruning within the TPZ of a tree.

1. **Removal of Pavement or Sidewalk:** Removal of existing

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pavement over tree roots shall include the following precautions:

- Break hardscape into manageable pieces with a jackhammer or pick and hand load the pieces onto a loader. The loader must remain outside the TPZ on undisturbed pavement or off exposed roots. Do not remove base rock that has been exploited by established absorbing roots.
- Apply untreated wood chips over the exposed area within one hour, then wet the chips and base rock and keep moist until overlay surface is applied.

2. **Replacement of pavement or sidewalk:** An alternative to the severance of roots greater than 2- inches in diameter should be considered before cutting roots. If an alternative is not feasible, remove the sidewalk, as stated above, cut roots with a sharp, clean saw, as approved by the project manager or Urban Forester and replace sidewalk using #3 dowels at the expansion joint if within 10-feet of a street tree. Use wire mesh reinforcement if within 10-feet of the trunk of a tree. Note: Any work in the right-of-way requires a ROW usage permit from the Transportation Department.
3. **Alternative methods to prevent root cutting:**
    - Grinding a raised sidewalk edge.
    - Ramping the walking surface over the roots or lifted slab with pliable paving. Routing the sidewalk around the tree roots.
    - Install boardwalk, flexible paving or rubberized sections.
4. **New sidewalk or driveway design should consider alternatives to conventional pavement and sidewalk materials:** Substitute permeable materials for typical asphalt or concrete overlay, sub-base or footings to consider are:
    - Permeable paving materials (such as ECO-Stone or RIMA pavers).
    - Interlocking pavers, flexible paving, wooden walkways, and brick or flagstone walkways on sand foundations.
5. **Avoid tree and infrastructure conflicts and associated costs by the following planting practices:**
    - Plant deep rooting trees that are proven to be non-invasive.

- Over soil that shrinks and swells, install a sidewalk with higher strength that has wire mesh and/or expansion slip joint dowel reinforcement.
- Fracture soil with an air spade and backfill with sand prior to planting to promote deep rooting and improved drainage.
- Install root barrier only along the hardscape area of the tree and allow roots to use open lawn or planter strip areas.
- Dedicate at least 10-linear feet of planting space for the growth of each tree.
- Provide a dedicated irrigation system or zone for the tree, so the trees do not have to compete and are not dependent on the turf and shrub irrigation.
- Avoid planting trees over underground drainage systems where root intrusion will impede function of the system.

6. **Alternative Base Course Materials:** When designing hardscape areas near trees, the project architect or engineer should consider the use of recommended base course material such as an engineered structural soil mix. An approved structural soil mix will allow a long term cost effective tree and infrastructure *co*mpatibility that is particularly suited for the following types of development projects:
    - Repair or replacement of sidewalk greater than 40-feet in length.
    - Planting areas that are designed over structures or parking garages.
    - Confined parking lot medians and islands or other specialized conditions as warranted.
7. In some cases, tree removal may be the preferred option if the site does not provide adequate space to account for future growth of the tree.

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1.5 Training

- Provide training to all construction personnel to make sure they understand all construction site BMPs.
- The project manager and the designated site manager(s) shall receive the most recent training and education dealing with construction site management. This training includes the most

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recent advances for protecting trees and erosion control on construction sites.

- Urban Foresters and site managers should receive training in appraising and evaluating tree and plant damage according to International Society for Arboriculture standards.